



# **PM<sub>2.5</sub> Qualitative Hot-spot Analysis**

## **I-80/94 Interchange Modification at I-65**

**DES Nos. 0065300, 0500590 & 0500593**

**Lake County, IN**

**March 30, 2007**

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## **PM<sub>2.5</sub> Qualitative Hot-spot Analysis**

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## **Air Quality Technical Report**

### **1.0 EXECUTIVE SUMMARY**

Federally supported highway and transit projects located in nonattainment or maintenance areas are required by section 176(c) of the Clean Air Act to be consistent with (“conform to”) the state implementation plan (SIP). Conforming to the SIP, according to Section 176(c)(1)(B) means that a transportation project, such as the I-80/94 Interchange Modification at I-65 project, will not

“cause or contribute to any new violation of any standard in any area; increase the frequency or severity of any existing violation of any standard in any area; or delay timely attainment of any standard or any required interim emission reductions in any area.”

The Transportation Conformity Rule was amended by United States Environmental Protection Agency (EPA) with the final rule on March 10, 2006. The Amended Transportation Conformity Rule requires a hot-spot analysis to determine project-level conformity in PM<sub>2.5</sub> and PM<sub>10</sub> nonattainment and maintenance areas. The amended rule also stated that qualitative hot-spot analysis would be performed on projects until such time that quantitative procedures are developed. A hot-spot analysis is an assessment of localized emissions impacts from a proposed transportation project and is only required for “projects of air quality concern.”

Based on an early interpretation of 40 CFR 93.123(b)(1) and the fact the no-build traffic data was not available, it was deemed appropriate to be conservative in determining that the I-80/94 Interchange Modification at I-65 project was a “project of air quality concern” since it met the definition in 40 CFR 93.123(b)(1)(i) “New or expanded highway projects that have a significant number or significant increase in diesel vehicles”.

An Interagency Consultation Team, comprised of representatives from the Indianapolis Department of Transportation (INDOT), Federal Highway Administration Indiana Division and the Resource Center (FHWA), Indiana Department of Environmental Management (IDEM), Northwestern Indiana Regional Planning Commission (NIRPC), United States Environmental Protection Agency Region 5 (EPA), United States Federal Transit Administration Region 5 (FTA), and INDOT’s consultant, was established to review the project, air quality status in the study area, existing air quality data, existing and future diesel truck volumes, and heavy-duty diesel emission trends to determine whether the I-80/94 Interchange Modification at I-65 project meets all the project level conformity requirements.

Based on the qualitative analysis prepared for the Interagency Consultation Team it is determined that the I-80/94 Interchange Modification at I-65 meets all the project level conformity requirements, and that the project will not cause or contribute to a new violation of the 24-hour or Annual PM<sub>2.5</sub> NAAQS, or increase the frequency or severity of a violation. Therefore, the project meets the conformity hot-spot requirements in 40 CFR §93.116 and §93.123 for PM<sub>2.5</sub>.

## **2.0 INTRODUCTION**

### **2.1 Purpose**

Federally supported highway and transit projects are required by section 176(c) of the Clean Air Act to be consistent with (“conform to”) the SIP. Conforming to the SIP, according to section 176(c)(1)(B) means that a transportation project, such as the I-80/94 interchange modification at I-65, will not

“cause or contribute to any new violation of any standard in any area; increase the frequency or severity of any existing violation of any standard in any area; or delay timely attainment of any standard or any required interim emission reductions in any area.”

The standards referred to in section 176(c)(1)(B) of the Clean Air Act are the National Ambient Air Quality Standards (NAAQS or “standards” or “criteria pollutants”).

Transportation conformity is required for federal supported transportation projects located in nonattainment or maintenance areas. Nonattainment areas are those regions, cities or portions of cities that have been designated by the EPA as not meeting a NAAQS. Maintenance areas had previously violated air quality standards, but currently meet them and have an approved maintenance plan.

The Transportation Conformity rule was amended by EPA with the final rule on March 10, 2006.<sup>1</sup> The amended Transportation Conformity rule required a hot-spot analysis to determine project-level conformity in PM<sub>2.5</sub> and PM<sub>10</sub> nonattainment and maintenance areas. The amended rule also stated that qualitative hot-spot analysis would be performed on projects until such time that quantitative procedures are developed. A hot spot analysis is an assessment of localized emissions impacts from a proposed transportation project and is only required for “projects of air quality concern.” The March 10, 2006 rule provides examples of “projects of air quality concern,” as well as those that are “not an air quality concern.” The PM<sub>2.5</sub> and PM<sub>10</sub> hot-spot requirements in the final rule became effective April 5, 2006. Project level conformity determinations are required pursuant to 40 CFR §93.116. and §93.123. Following the publication of the final rule, the EPA and the FHWA released a conformity guidance manual to aid in the application of the new rule.<sup>2</sup>

The I-80/94 qualitative hot-spot analysis report presents a project description, the air quality status in the study area, existing air quality data, existing and future diesel truck volumes, emission factor trends and a conclusion that this project will not cause or contribute to a new violation of the PM<sub>2.5</sub> NAAQS, or increase the frequency or severity of a violation.

### **2.2 Project Description**

The Environmental Assessment for the entire I-80 corridor stated that

“I-80 is one of the key commercial vehicle and automobile corridors for cross-country travel in the U.S. When accompanied by companion route I-90/94, this corridor south of Lake Michigan becomes the most crucial, most congested, and the least predictable in terms of travel speed and time in the U.S.”<sup>3</sup>

The FHWA “concurred with the finding of no significant impact for the Environmental Assessment for the entire I-80 corridor on April 29, 2004”<sup>4</sup> The INDOT proposed I-80/94 Interchange Modification at I-65 is the last improvement identified in the EA to be constructed along the I-80/94 corridor. The general location of the project is shown on Figure 1. A more detailed map of the study area is shown on Figure 2.

The existing cross section of the I-80/94 mainline, from just east of Georgia Street to the eastern terminus, has three 12 foot travel lanes in both directions. Both the outside and inside shoulders are 12 feet in width with a center median barrier separating the inside shoulders.

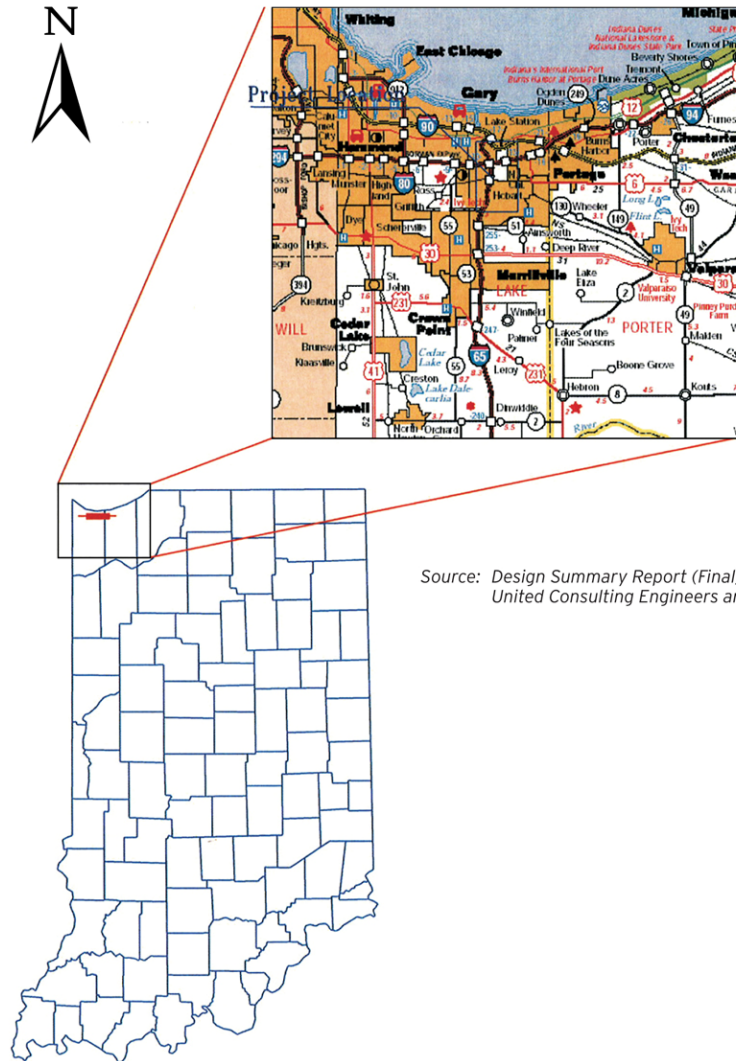
The I-65 existing cross section at the southern terminus of the project, in the vicinity of E 35<sup>th</sup> Avenue, has four 12 foot travel lanes in both directions. The inside shoulders in both direction are 14 feet wide separated by a median barrier. The outside shoulders are 12 feet wide. The north bound I-65 off ramp to west bound I-80/94 has two 12 foot travel lanes bordered by 12 foot wide outside shoulder and a 4 foot wide inside shoulder. The ramp tapers down to a one lane ramp prior to merging onto west bound I-80/94. The east bound off ramp from I-80/94 to south bound I-65 begins with a 15 foot wide travel lane with a 10 foot wide outside shoulder and a 4 foot wide inside shoulder. Within the first 1000 feet of the ramp gore the pavement widens to two 11 foot lanes

North of the I-65 north bound to I-80/94 west bound and I-80/94 east bound to I-65 south bound directional ramps the existing cross section of I-65 has two 12 foot wide travel lanes in both directions. The outside shoulder varies from 10 to 12 feet. The inside shoulders vary from 14 feet wide in both directions, separated by a median barrier at the southern end, to a paved median 60 feet wide with a center safety barrier just prior to the I-65 bridge structures over the I-65 north bound to I-80/94 west bound ramp. North of the interchange to the northern terminus the cross section of I-65 on structure is the same. When I-65 is not on structure the grass median is 45 feet wide.

# I-80/94 Interchange Modification at I-65 Lake County, IN

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Indiana Department of Transportation  
PM<sub>2.5</sub> Qualitative Hot Spot Analysis



Source: Design Summary Report (Final), June 30, 2005  
United Consulting Engineers and Architects

**HNTB**

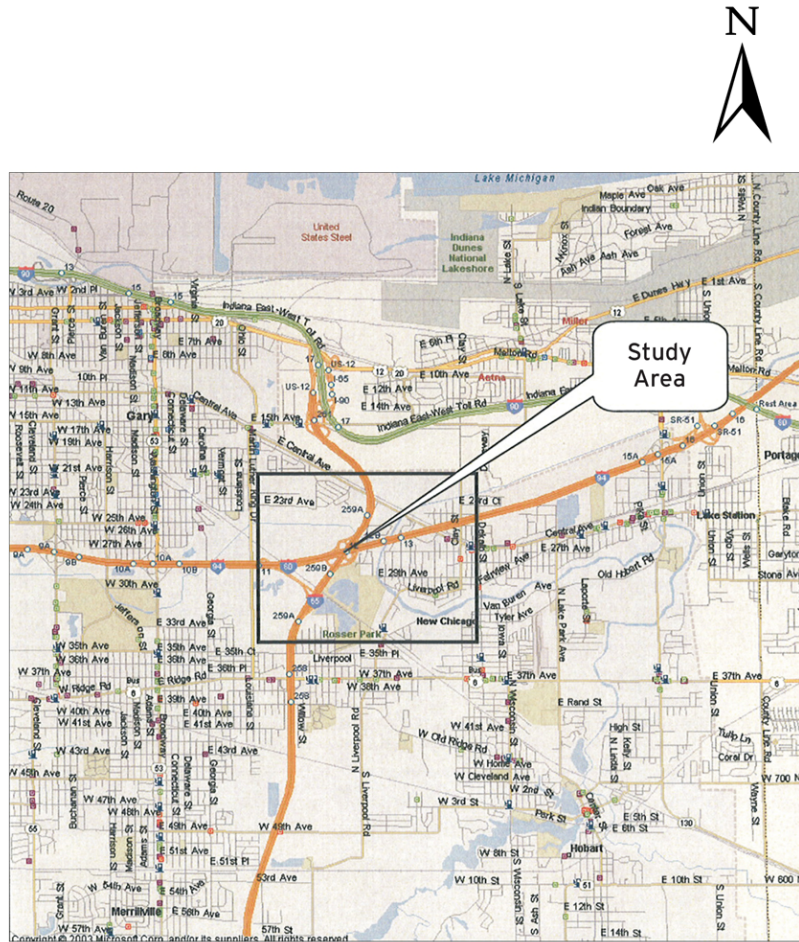
PM<sub>2.5</sub> Qualitative Hot-spot Analysis  
I-80/94 Interchange Modification at I-65  
Lake County, IN

Figure 1  
Project Location

# I-80/94 Interchange Modification at I-65 Lake County, IN

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Indiana Department of Transportation  
PM<sub>2.5</sub> Qualitative Hot Spot Analysis



Source: Design Summary Report (Final), June 30, 2005  
United Consulting Engineers and Architects



PM<sub>2.5</sub> Qualitative Hot-spot Analysis  
I-80/94 Interchange Modification at I-65  
Lake County, IN

Figure 2  
Study Area

The proposed reconstruction of I-80 begins approximately 0.2 mile east of Georgia Street in Gary, IN, continues east through the I-65 interchange terminating 0.8 mile east of Clay Street in Lake Station, IN. Along I-65 the reconstruction begins south of the interchange at 37<sup>th</sup> Street in Hobart, IN, continuing north through the I-80/94 interchange extending to the south bridge approach of I-65 over Central Avenue and Conrail Calumet railroad in Gary, IN. The total length along I-80/94 (Borman Expressway) is 2.84 miles. The length for the I-65 reconstruction is 1.31 miles. The project is scheduled to be completed in December of 2009. Improvements will include, but not be limited to the following:<sup>5</sup>

- Accommodate projected 20-year traffic growth.
- Four 12.0 foot travel lanes bordered by a 14.0 foot inside shoulder and 14.0 foot outside shoulder in each direction on I-80/94.
- A 30.5 foot wide median with a 2.5 foot median barrier between the eastbound and westbound lanes on I-80/94.
- Revised vertical profile to facilitate drainage.
- A collector distributor road adjacent to both the eastbound and westbound lanes along I-80/94 from just west of I-65 to just east of the Central Avenue interchange.
- A new semi-directional ramp for the westbound movement from I-80/94 to I-65.
- Four 12.0 foot travel lanes bordered by a 14.0 foot shoulder and a 12.0 foot outside shoulder in each direction with a 2.5 foot barrier median on I-65 from the south project limits to the I-80/94 interchange.
- Two 12.0 foot travel lanes bordered by a 14.0 foot shoulder and a 12.0 foot outside shoulder in each direction with a 2.5 foot barrier median on I-65 from the I-80/94 interchange to the northern terminus.
- A collector distributor road adjacent to both the northbound and southbound lanes along I-65 from 37<sup>th</sup> Avenue to the I-80/94 interchange.
- Two 12.0 foot travel lanes bordered by a 10 foot outside shoulder and a 6.0 foot inside shoulder for both the I-65 north bound to I-80/94 west bound and I-80/94 east bound to I-65 south bound directional ramps. Where these two ramps are parallel they will be separated by safety barrier median.

The cross sections of the proposed improvements at the west terminus and south terminus will match the recently completed cross section of I-80/94 and the existing cross section of I-65, respectively. The proposed improvements at the western terminus of this section of I-80/94 are extremely important to avoid the possibility of congestion created by 4 lanes of east bound main line traffic merging into three lanes just past Georgia Street. A comparison of existing and future conditions is presented on Figure 3.

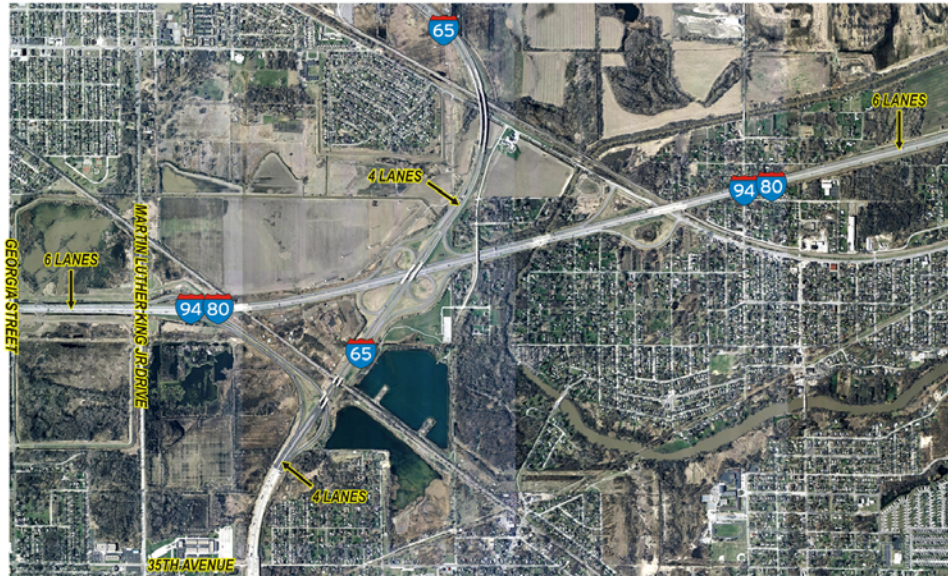


# I-80/94 Interchange Modification at I-65 Lake County, IN

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## EXISTING



Not to Scale

## FUTURE



PM<sub>2.5</sub> Qualitative Hot-spot Analysis  
I-80/94 Interchange Modification at I-65  
Lake County, IN

Figure 3  
Existing and  
Future Conditions

### **3.0 AFFECTED ENVIRONMENT**

#### **3.1 Particulate Matter**

Particulate matter is the general term used for a mixture of solid particles and liquid droplets found in the air. The very large particulates settle to the ground, while the smaller particulates stay suspended in the air. Some are visible to the naked eye; others require a microscope to be seen. "PM<sub>2.5</sub> describes the 'fine' particles that are less than or equal to 2.5 µm in diameter. 'Coarse fraction' particles are greater than 2.5 µm, but less than or equal to 10 µm in diameter. PM<sub>10</sub> refers to all particles less than or equal to 10 µm in diameter."<sup>6</sup> Even though PM<sub>10</sub> can be inhaled, PM<sub>2.5</sub>, due to its small diameter (approximately 1/30th the average width of a human hair), and the ability to become lodged in the lungs, is believed to pose the greatest health risk.<sup>7</sup> Road dust and soot from wood combustion are referred to as "primary" particles as they are emitted directly into the atmosphere. Particulates that form in the atmosphere from primary gaseous sources are referred to as "secondary" particulates. Examples of secondary particulates include "sulfates, formed from SO<sub>2</sub> emissions from power plants and industrial facilities, and nitrates, formed from NO<sub>x</sub> emissions from power plants, automobiles, and other types of combustion sources. The chemical composition of particles depends on location, time of year, and weather. Generally, coarse PM is composed largely of primary particles and fine PM contains many more secondary particles."<sup>8</sup>

The NAAQS for PM<sub>10</sub> includes an annual standard (50.0 micrograms per cubic meter (ug/m<sup>3</sup>)) and a 24-hour standard (150 ug/m<sup>3</sup>). The NAAQS for PM<sub>2.5</sub> includes an annual standard of 15.0 ug/m<sup>3</sup> and a 24-hour standard of 65 ug/m<sup>3</sup>. The PM secondary (welfare-based) standards have been revised by making them identical to the primary standards. EPA believes that the PM<sub>2.5</sub> and PM<sub>10</sub> standards, combined with the Clean Air Act-required regional haze program, will provide protection against the major PM-related welfare effects, including visibility impairment, soiling and materials damage.

The I-80/I-94 Interchange Modification at I-65 project is located within the Metropolitan Chicago Interstate Air Quality Control Region (AQCR #67). A portion of Lake County had been in nonattainment for PM<sub>10</sub>. Indiana's PM<sub>10</sub> SIP was approved in 1995.<sup>9</sup> Lake County is presently in a maintenance area for PM<sub>10</sub>, granted redesignation from EPA in early 2003.<sup>10</sup> In the redesignation document and approval of the Maintenance Plan it was acknowledged that mobile sources are insignificant.<sup>10</sup> Upon further investigation it was verified that mobile sources are insignificant on both the regional and local levels.<sup>11</sup> Lake County is currently in attainment status for five (5) of the seven (7) criteria pollutants, and has been classified as being in non-attainment for PM<sub>2.5</sub> and classified as being in moderate nonattainment for the 8-hour ozone standard.

IDEM operates 30 particulate air monitoring sites in the state. Nine (9) of those are located within 4.5 miles of the I-80/94 corridor in Hammond, East Chicago, Griffith, and Gary, in Lake County and Ogden Dunes in Porter County. These nine (9) monitoring locations are shown on Figure 4, Appendix A. Monitored PM<sub>2.5</sub> yearly annual means and the three year design values for each site, where data is available is presented in Table 1. 24-hour data from the same monitoring locations is presented in Table 2. None of the monitors exceeded the 24-hour 65 ug/m<sup>3</sup> NAAQS for PM<sub>2.5</sub>.

The study area is highly industrialized along with an extremely dense population. Four (4) of the seven (7) active PM<sub>2.5</sub> monitors are located in residential areas. Site 9 is located in an undeveloped area. These five (5) sites have had Three Year Design Values below the annual standard of 15.0 ug/m<sup>3</sup> in 2004 and 2005. Two (2) of the active seven (7) sites are located near specific sources. The Gary IITRI location, Site 8 on Table 1 and Figure 4, is sited as a high concentration site for the USX steel mill (formerly the United States Steel Corp.). The Gary Burr St location, Site 5 on Table 1 and Figure 4, is a high concentration site near two (2) large truck stops. These two sites are not compared to the annual standard. All others are considered population oriented and compared to the NAAQS. Even though Burr St. is oriented toward the truck stop, it still has population orientation as one of its objectives. The IITRI has no population orientation.<sup>12</sup>

Generally it is believed that the majority of the PM<sub>2.5</sub> in the study area is very similar to other areas of the State of Indiana being comprised of background concentrations slightly elevated by typical city sources and transportation. The study area is only a couple of ug/m<sup>3</sup> higher than in rural areas. The Gary IITRI site is obviously influenced by the emissions from the USX facility. Concentrations at the Burr St site, when compared to the Ivanhoe School location, Site 4 on Table 1 and Figure 4, are typically about 3 ug/m<sup>3</sup> greater than at the school.<sup>13</sup> The Ivanhoe site is only about one mile north of the Burr St. site. It is believed that the higher PM<sub>2.5</sub> concentrations are the result of emissions from idling diesel trucks at truck stops on both sides of Burr St.

Three to five years of data is not sufficient to establish accurate trends. However, data in Table 1 indicates that PM<sub>2.5</sub> concentration levels increased in 2005 over previous years. This also happened in other areas of Indiana. Early data from 2006 indicates a slight decrease in concentrations. Depending on the areas of the state these variations could be created by different sources. At this time there is much to be learned about what is causing the fluctuations in PM<sub>2.5</sub> concentration levels<sup>14</sup>.

The Burr St. location, Site 5, and the Hammond Purdue location, Site 1 on Table 1 and Figure 4 are the two closest PM<sub>2.5</sub> monitors to the I-80/94 corridor. The next closest is the Ivanhoe School location, Site 4. As stated above, the Burr St. monitor was located specifically for the two (2) truck stops adjacent Burr St. and should not be considered representative of the study area. Ivanhoe School is 1.2 miles north of the corridor. Therefore, the Hammond Purdue location, being only 0.7 miles north of the corridor is the most representative of the air quality in the vicinity of the interchange.

**I-80/94 Interchange Modification at I-65  
Lake County, IN**

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PM<sub>2.5</sub> Qualitative Hot Spot Analysis

Table 1  
Draft PM<sub>2.5</sub> Annual Monitoring Data Summary  
Lake and Porter Counties, IN

Site # on Figure 3	City	Site Name	Yearly Annual Means, ug/m <sup>3</sup>						Three Year Design Values, ug/m <sup>3</sup>			
			2000	2001	2002	2003	2004	2005	00-02	01-03	02-04	03-05
1	Hammond	Purdue	14.96	15.38	14.70	14.55	13.26	15.55	15.00	14.90	14.20	14.50
2	East Chicago	Franklin School	15.76	16.11	14.92	14.60	13.18	15.67	15.60	15.20	14.20	14.50
3	Highland	Eldon Ready School	14.04	15.18	14.60	14.10	12.82	15.53	14.60	14.60	13.80	14.20
4	Gary	Ivanhoe School	15.33	14.98	15.22	14.14	12.92	15.59	15.20	14.80	14.10	14.20
5	Gary	Burr St	17.24	18.19	17.67	17.38	16.53	18.81	17.70	17.70	17.20	17.60
6	Gary	Gary Water	Site in system 4th quarter of 2003, no published data.									
7	Gary	Federal Bldg	16.03	16.26	15.92	Monitor Shut Down in Sep 2002			16.10	Monitor Shut Down in Sep 2002		
8	Gary	IITRI	17.38	17.99	16.43	16.63	16.10	18.31	17.30	17.00	16.40	17.00
9	Ogden Dunes	Water Treatment Plant	14.55	14.18	14.20	12.94	12.38	14.58	14.30	13.80	13.20	13.30

Value above the annual standard

Note: The Annual Standard is 15.0 micrograms per cubic meter (ug/m<sup>3</sup>) and attainment is determined by the average of the Particulate Matter (PM) 2.5 values over a three-year period. If a monitor is 15.0 ug/m<sup>3</sup> or higher it is considered nonattainment.

Source: <http://www.in.gov/idep/programs/air/catalog/pmsummary2000to2005.pdf>

Table 2  
Draft PM<sub>2.5</sub> 24-Hour Monitoring Data Summary  
Lake and Porter Counties, IN

Site # on Figure 3	City	Site Name	24-Hour 98 <sup>TH</sup> Percent, ug/m <sup>3</sup>					
			2000	2001	2002	2003	2004	2005
1	Hammond	Purdue	33	36	34	32	32	38
2	East Chicago	Franklin School	34	40	37	33	33	40
3	Highland	Eldon Ready School	32	37	32	36	30	37
4	Gary	Ivanhoe School	33	37	33	31	31	39
5	Gary	Burr St	34	42	39	42	39	44
6	Gary	Gary Water	Site in system 4th quarter of 2003, no published data.					40
7	Gary	Federal Bldg	35	41	40	Monitor Shut Down in Sep 2002		
8	Gary	IITRI	44	50	40	46	46	40
9	Ogden Dunes	Water Treatment Plant	32	35	33	37	29	38

Value above the annual standard

Note: The 24-Hour Standard is 65.0 micrograms per cubic meter (ug/m<sup>3</sup>).

Source: <http://www.epa.gov/air/data/> last updated on Tuesday, September 26th, 2006

## 4.0 QUALITATIVE ANALYSIS

### 4.1 Interagency Consultation

The interagency consultation began on May 22, 2006 with a web-conference presented by Jeff Houk of the FHWA Denver Resource Center. The web-conference was established to introduce FHWA's Indiana office, INDOT, IDEM, EPA Region 5 and INDOT consultants to the PM<sub>2.5</sub> conformity process and directly addressed the I-80/94 interchange modifications at I-65. Following the web-conference a conference call was held on June 8, 2006 to discuss the steps necessary to complete the qualitative analysis. Based on an early interpretation of 40 CFR 93.123(b)(1) and the fact the no-build traffic data was not available, it was deemed appropriate to be conservative in determining that this project was a "project of air quality concern" since it met the definition in 40 CFR 93.123(b)(1)(i) "New or expanded highway projects that have a significant number or significant increase in diesel vehicles".<sup>15</sup> The air quality study approach was determined to be the most applicable to this hot-spot analysis. The

qualitative analysis methodology agreed upon was to present projected traffic data, present trends in heavy duty diesel truck emission rates, present the results of specific particulate research studies performed along the I-80/94 corridor, and present regional particulate data. The interchange modification project is scheduled to be complete in late 2009, after a 2-year construction period.

Neither EPA nor IDEM has determined that re-entrained road dust is a significant contributor to PM<sub>2.5</sub> concentrations in Lake County.<sup>16</sup> Also, the proposed construction schedule for the interchange modifications has the project starting in 2007 with completion in late 2009, a construction period of less than five years. Therefore, neither re-entrained road dust nor particulate construction emissions will be analyzed in this qualitative hot-spot analysis.

One of the requirements for hotspot analysis is that it addresses the year or years of peak emissions. Trends in regional emissions, trends in motor vehicle emissions rates, and projected traffic volumes were examined to determine the appropriate analysis year(s). The MOBILE6.2 emissions rate for heavy-duty diesel trucks is expected to decline by 79% between 2010 and 2030 (see section 3.3). Heavy-duty truck traffic in the project area is expected to increase by approximately 50% during that same period, meaning that the emissions reductions due to cleaner vehicles will more than offset increases in truck VMT. Regional mobile source emissions of PM<sub>2.5</sub> and NO<sub>x</sub> (a PM<sub>2.5</sub> precursor) are expected to decline by 32% and 76%, respectively, between 2010 and 2030 (see section 3.5). Finally, emissions reductions due to implementation of control programs on motor vehicles and electrical utilities will reduce regional background levels (as noted above, PM<sub>2.5</sub> concentrations in rural areas are nearly as high as those in the urbanized project area). Therefore, it was agreed that the year of peak emissions would be the opening year of the project, 2010.

#### 4.2 Traffic Data

Traffic volumes in the study corridor are projected to grow at a rate of 2.05 to 2.09% per year for the next 20 years. The effects of this growth are presented in Table 2 in terms of mainline peak hour level of service (LOS). The information presented in the table is in terms of length percentage. Based on the data presented in Table 3, in the 1997 base year, 54% of the corridor was operating at LOS C with only 7% operating at forced flow (LOS F). No improvements to I-80/94 results in 26% of the corridor operating at LOS E and an additional 59% operating at forced flow, LOS F, in the year 2024. Improving the corridor by adding an additional lane in each direction, additional weaving lanes to allow safer access to and from ramps and additional lanes on the major interchanges would eliminate all LOS E and F operations through the year 2024.

Table 3  
Peak Hour LOS Length Percentages  
I-80/94, Illinois State Line to the I-65 Interchange

Level of Service	Existing Configuration, % of Corridor			Proposed Configuration, % of Corridor	
	1997	2006	2024	2006	2024
A – Overbuild	0	0	0	0	0
B – Very Desirable	0	0	0	17	0
C – Desirable	54	18	0	83	58
D – Minimum	31	64	15	0	42
E – Substandard	8	11	26	0	0
F – Forced Flow	7	7	59	0	0

Source: Environmental Assessment, Interstate 80/94, Calumet Avenue to Clay Street, Lake County, Indiana, FHWA and INDOT, January 21, 2003.

Since the interchange modification is the last in a series of improvements along the corridor, it is extremely likely that this growth will take place whether the project is or is not constructed. Data in Table 3 indicates that A.A.D.T for heavy duty diesel truck traffic on I-80/94 will increase from 39,725 in 2006 to 59,628 by 2026. Based on the 2.05% annual growth rate from 2006 to 2026, the 2010 opening year traffic would increase from 43,086 to 64,673 by 2030, a 50% increase. A.A.D.T heavy duty diesel truck traffic on I-65 will increase from 22,991 to 34,880 by 2026. Based on the 2.09% annual growth rate from 2006 to 2026, the 2010 opening year traffic would increase from 24,978 to 37,808 by 2030, a 51% increase.

Table 4  
Existing and Future Traffic  
I-80/94 Interchange Modification at I-65

Roadway	Existing (2006)			Future (2026)		
	A.D.T.	Truck Percentage	Truck Volume A.A.D.T	A.D.T.	Truck Percentage	Truck Volume A.A.D.T
I-80/94	158,900	25	39,725	238,510	25	59,628
I-65	85,150	27	22,991	128,890	27	34,800

Source: I-80/94 Interchange Modification at I-65 Design Summary Report (*Final*), Page 23, prepared by United Consulting Engineers for INDOT, June 30, 2005.

#### 4.3 Heavy Duty Diesel Emission Trends

According to EPA, the 2007 heavy-duty engine standards will result in the introduction of new, highly effective control technologies for heavy-duty engines, beginning in 2007. Particulate matter emission levels are expected to be 90 percent lower on a per vehicle basis than 2000 standards levels due to the 2007 diesel engine and fuel program. On-

Road diesel trucks will implement Ultra Low Sulfur Diesel (ULSD) in the fall of 2006. As older heavy duty diesel vehicles are replaced with newer less polluting vehicles, the heavy duty diesel truck fleet emission rate in northeastern Indiana is projected to decrease 79% from the year the project is completely open to traffic, January 2010, through January 2030. Heavy duty diesel vehicle PM<sub>2.5</sub> emission rates for the study corridor are presented in Table 4.

Table 5  
Heavy Duty Diesel Vehicle PM<sub>2.5</sub> Emission Rates  
I-80/94 Interchange Modification at I-65

Month	Total PM <sub>2.5</sub> Heavy Duty Diesel Vehicle Emission Rates, g/mi		
	Year		
	2010	2020	2030
January	0.1752	0.0493	0.0360

Source: E-mail correspondence Bill Brown, NIRPC, to John Jaeckel, HNTB Corporation, July 12, 2006.

#### 4.4 Local Air Quality Studies

Two recent research projects have been completed along the I-80/94 corridor that examined local air quality as affected by highway incidents and moving lane closures. The report on highway incidents observed that it was possible for PM<sub>2.5</sub> concentrations to increase by 100% during the immediate time period after a peak hour traffic incident.<sup>17</sup>

The second research paper addressed the impacts of moving lane closures. Although this paper did not directly address PM<sub>2.5</sub> concentrations, it did address PM<sub>2.5</sub> flux which is the mass transport of PM<sub>2.5</sub> and accounts for the influence of wind speed on ambient PM<sub>2.5</sub> concentrations. During the peak congestion created by the moving lane closures, the maximum difference was an increase of 218%.<sup>18</sup>

#### 4.5 Regional Emission Trends

Regional mobile source emissions in the nonattainment area are projected by the Northwestern Indiana Regional Planning Commission (NIRPC) to decrease by over 60% for PM<sub>2.5</sub> and over 89% for NOx emissions from 2002 to 2030. The results of the regional emissions analysis are presented in Table 6<sup>19</sup>. The direct PM<sub>2.5</sub> emissions are mobile exhaust emissions, brake wear and tire wear. The NOx precursor emissions are mobile exhaust emissions.<sup>20,21</sup>



Table 6  
Lake and Porter County Regional Emissions Analysis, US Tons/Year

Nonattainment Area	2002	2010	2020	2030
<b>Northeastern Illinois</b>				
US Tons/Year				
Direct PM <sub>2.5</sub> Emissions	3,070.78	1,496.62	1,060.28	1,066.54
NOx Precursor Emissions	167,630.81	69,978.38	24,002.72	17,806.39
<b>Northwestern Indiana</b>				
Direct PM <sub>2.5</sub> Emissions	562.64	163.14	115.79	118.67
NOx Precursor Emissions	30,397.97	8,732.61	3,052.01	2,109.08
<b>Nonattainment Area Total</b>				
Direct PM <sub>2.5</sub> Emissions	3,633.42	1,659.76	1,176.07	1,185.21
NOx Precursor Emissions	198,028.78	78,710.99	27,054.73	19,915.47
Sum of PM <sub>2.5</sub> Emissions	201,662.20	80,370.75	28,230.81	21,100.67

Source: Air Quality Conformity Determination, Northwestern Indiana Regional Planning Commission, Portage, IN, July 20, 2006.

## 5.0 REGIONAL CONFORMITY STATUS

The I-80/94 Interchange Modification at I-65, Transportation Improvement Program (TIP) # 17 is included in Air Quality Conformity Determination between the Connections 2030 Regional Transportation Plan, the Fiscal Year 2005-2009 Transportation Improvement Program and the Indiana State Implementation Plan for Air Quality, prepared by NIRPC, the Metropolitan Planning Organization (MPO) for the region in which the project is located.

The NIRPC Air Quality Conformity Determination concludes “the annual direct PM<sub>2.5</sub> and nitrogen oxide emissions that result from the implementation of the projects in the Connections 2030 Regional Transportation Plan and Fiscal Year 2005 to 2009 Transportation Improvement Program, as defined by the action scenarios in Lake and Porter counties for 2010, 2020 and 2030 are no greater than the 2002 emissions. Therefore, **the Connections 2030 Regional Transportation Plan and Fiscal Year 2005 to 2009 Transportation Improvement Program have been found to conform to the requirements of section 176(c) of the Clean Air Act Amendment and the related requirements of the Final Transportation Conformity Rule (40 CFT Part 51 and 40 CFR Part 93 with respect to PM<sub>2.5</sub>.**”<sup>22</sup>

EPA has provided guidance on the conformity analysis procedures for PM<sub>2.5</sub>. The PM<sub>2.5</sub> SIP is due in August of 2008. Approval is expected to take a least one year. The most recent modeling indicates that Lake County should be below the PM<sub>2.5</sub> standard by 2009.<sup>23</sup>

## **6.0 CONCLUSION**

The qualitative hot-spot analysis for the I-80/94 Interchange Modification at I-65 project indicates that:

- The corridor is a key cross-country corridor for commercial and automobile traffic. The increased traffic is not only created by local growth but also by national growth. Therefore, traffic in 2009/2010, the time period during which the project should be completed, will be the same, without the increased capacity or with the increased capacity. The major difference will be considerably less congestion once the entire project is completed.
- Based on MOBILE6.2 results, heavy duty diesel truck emission rates are projected to decrease from 0.1752 g/mi in 2010 to 0.0360 g/mi by 2030, a 79.5% reduction. The reductions in emission rates are considerably greater than the projected increase in heavy duty diesel truck traffic resulting in a reduction in heavy duty diesel truck emissions. Also, regional projections show that mobile source emissions of PM<sub>2.5</sub> and NO<sub>x</sub> in the nonattainment area will decline by 29% and 75%, respectively, between 2010 and 2030.
- Based on the LOS analysis prepared for the I-80/94 Environmental Assessment, LOS operating conditions would deteriorate significantly without the improvements, specifically:
  - Not completing the I-80/94 Interchange Modification at I-65 project will lead to increased congestion along the east bound mainline as traffic merges from a four lane cross section to a three lane.
  - With the entry to the I-80/94 east bound off ramp from to south bound I-65 being only one lane wide, future demand at this ramp would increase congestion in the immediate vicinity of the ramp gore.
  - With the I-65 north bound ramp to east bound I-80/94 narrowing from two lanes to only one at the western terminus, future demand at this ramp would increase congestion in the merge area.
  - Therefore, completing the I-80/94 Interchange Modifications at I-65 will improve traffic flow through the interchange.
- Two air quality studies along the I-80/94 corridor have identified that short term congestion results in significant increases in short term PM<sub>2.5</sub> concentrations. As noted above, the effect of this project will be to reduce the prevalence of these congestion problems. This will have the effect of reducing 24-hour average concentrations in the vicinity of the project. Also, since these congestion problems currently occur on almost a daily basis, mitigation of the congestion problems in the vicinity of the interchange will also reduce annual average PM<sub>2.5</sub> concentrations. The improvements to traffic flow, even though they are focused on mitigating short-duration congestion problems, will have the effect of reducing daily and annual PM<sub>2.5</sub> concentrations compared to the no-build alternative. Thus, the I-80/94 Interchange Modifications at I-65 will not cause or contribute to a new violation of the PM<sub>2.5</sub> NAAQS (24-hour standard or annual standard), or increase the frequency or severity of a violation.
- The July 2006 Air Quality Conformity Determination concluded that the projects in the Connections 2030 Regional Transportation Plan and Fiscal Year 2005 to 2009 Transportation Improvement Program, including this project, conform to the

requirements of section 176(c) of the Clean Air Act Amendment and the related requirements of the Final Transportation Conformity Rule (40 CFT Part 51 and 40 CFR Part 93 with respect to PM<sub>2.5</sub>.

Based on the qualitative hot-spot analysis and consultation between the INDOT, IDEM, NIRPC, FHWA, and USEPA on February 6, 2007, it is determined that the I-80/94 Interchange Modification at I-65 project meets all the project level conformity requirements, and that the I-80/94 Interchange Modification at I-65 project will not cause or contribute to a new violation of the PM<sub>2.5</sub> NAAQS, or increase the frequency or severity of a violation. Therefore, the project meets the conformity hot-spot requirements in 40 CFR §93.116 and §93.123 for PM<sub>2.5</sub>.

## **7.0 REFERENCES**

- 1 EPA posted the final rule on its website on March 1, 2006 and the final rule was published in the Federal Register on March 10, 2006.
- 2 Transportation Conformity Guidance for Qualitative Hot-spot Analysis in PM<sub>2.5</sub> and PM<sub>10</sub> Nonattainment and Maintenance Areas, US Environmental Protection Agency and Federal Highway Administration, EPA420-B-06-902, March 2006
- 3 I-80/94 Interchange Modification at I-65 Design Summary Report (Final), Page 11, prepared by United Consulting Engineers for INDOT, June 30, 2005.
- 4 Ibid, p12.
- 5 Ibid, pp 1-2.
- 6 <http://www.epa.gov/air/airtrends/aqtrnd01/pmatter.html>
- 7 <http://www.epa.gov/pmdesignations/faq.htm#0>
- 8 <http://www.epa.gov/air/airtrends/aqtrnd01/pmatter.html>
- 9 Federal Register, Rules and Regulations, Pages 31412 – 31414, June 15, 1995 (Volume 60, Number 115).
- 10 Federal Register, Rules and Regulations, Pages 1370 – 1373, January 10, 2003 (Volume 68, Number 7).
- 11 E-mail correspondence, Patricia Morris, US EPA, to John Jaeckel, HNTB Corporation, December 18, 2006, verifying that mobile sources were insignificant on both a regional and local level.
- 12 E-mail correspondence between Laurence Brown, IDEM and John Jaeckel, HNTB Corporation, from October 2, 2006 through October 4, 2006.
- 13 E-mail correspondence from Laurence Brown, IDEM, to John Jaeckel, HNTB Corporation, discussing PM<sub>2.5</sub> sources, October 4, 2006.
- 14 E-mail correspondence, Ken Ritter, IDEM to John Jaeckel, HNTB, July 19, 2006.
- 15 Conference call, Emily Biondi, FHWA HQ, Jeff Houk, FHWA Denver Resource Center, and Larry Heil, FHWA Indiana Division, June 8, 2006.
- 16 E-mail correspondence, Patricia Morris, US EPA, to John Jaeckel, HNTB Corporation, October 23, 2006.
- 17 Impact of Highway Incidents on Local Air Quality, Paper 589, Salimol Thomas, School of Civil Engineering, Purdue University, and Robert B. Jacko, Ph.D, P.E., Professor, School of Civil Engineering, Purdue University.
- 18 The Impact of Moving Lane Closures on Local Ambient Air Quality, William Schneider IV, Ph.D., Assistant Research Scientist, Texas Transportation Institute, and Robert B. Jacko, Ph.D, P.E., Professor, School of Civil Engineering, Purdue University, presented at the 2005 Annual Air and Waste Management Association Meeting.
- 19 E-mail correspondence from Bill Brown, NIRPC, to John Jaeckel, HNTB Corporation, updating direct and precursor emissions quantities, February 6, 2007.
- 20 E-mail correspondence from Bill Brown, NIRPC, to John Jaeckel, HNTB Corporation, clarifying contents of regional emissions analysis, July 12, 2006.
- 21 E-mail correspondence from Laurence Brown, IDEM, to John Jaeckel, HNTB Corporation, clarifying source of regional emissions analysis results, June 27, 2006.

- 22 Air Quality Conformity Determination between the Connections 2030 Regional Transportation Plan, the Fiscal Year 2005-2009 Transportation Improvement Program and the Indian State Implementation Plan for Air Quality, prepared by NIRPC, Portage, IN, July 20, 2006.
- 23 E-mail correspondence from Laurence Brown, IDEM, to John Jaeckel, HNTB Corporation, clarifying status of particulate SIP, June 27, 2006.